

CORRECTED VERSION

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
1 July 2004 (01.07.2004)

PCT

(10) International Publication Number
WO 2004/055098 A3

(51) International Patent Classification⁷: **C08G 79/00**,
79/04, 79/06

(21) International Application Number:
PCT/CA2003/001982

(22) International Filing Date:
16 December 2003 (16.12.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/433,507 16 December 2002 (16.12.2002) US

(71) Applicant (for all designated States except US): **THE
UNIVERSITY OF BRITISH COLUMBIA** [CA/CA];
University - Industry Liaison Office, #103, 6190 Agron-
omy Road, Vancouver, British Columbia V6T 1Z3 (CA).

(72) Inventors; and

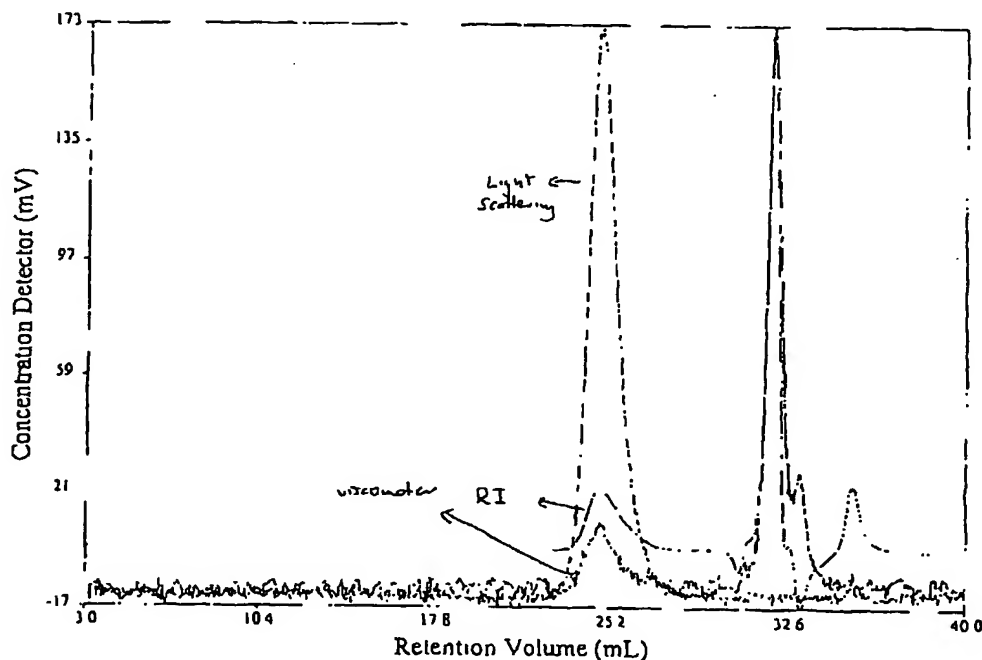
(75) Inventors/Applicants (for US only): **GATES, Derek**
[CA/CA]; #7, 2015 West 3rd Avenue, Vancouver, British
Columbia V6J 1L4 (CA). **TSANG, Chi-Wing** [—/CA];
2081 West 44th Avenue, Vancouver, British Columbia
V6M 2G1 (CA). **YAM, Mandy** [CA/CA]; #13, 10480 No.
3 Road, Richmond, British Columbia V7A 1W9 (CA).

(74) Agents: **ROBINSON, J., Christopher** et al.; Smart &
Biggar, Suite 2200, 650 West Georgia Street, Box 11560,
Vancouver, British Columbia V6B 4N8 (CA).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR,
CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD,
GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN,
MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU,
SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA,
UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

[Continued on next page]

(54) Title: POLYMERIZATION OF PHOSPHAALKENES



(57) Abstract: Methods for polymerization of phosphaaalkenes using initiators are provided. Also provided are polymers and co-polymers in which the polymer backbone contains tracts of carbon and phosphorus atoms in approximately equimolar amounts. C-P bonds in the polymers of this invention may be predominantly in a head-to-tail arrangement or mixed arrangements. Co-polymers may comprise polyolefin monomer units.

BEST AVAILABLE COPY

WO 2004/055098 A3



(84) Designated States (*regional*): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

(88) Date of publication of the international search report:
2 September 2004

(48) Date of publication of this corrected version:

2 December 2004

(15) Information about Correction:

see PCT Gazette No. 49/2004 of 2 December 2004, Section II

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
1 July 2004 (01.07.2004)

PCT

(10) International Publication Number
WO 2004/055098 A3

(51) International Patent Classification: **C08G 79/00**,
79/04, 79/06

(21) International Application Number:
PCT/CA2003/001982

(22) International Filing Date:
16 December 2003 (16.12.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/433,507 16 December 2002 (16.12.2002) US

(71) Applicant (for all designated States except US): **THE UNIVERSITY OF BRITISH COLUMBIA** [CA/CA];
University - Industry Liaison Office, #103, 6190 Agronomy Road, Vancouver, British Columbia V6T 1Z3 (CA).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **GATES, Derek**

[CA/CA]; #7, 2015 West 3rd Avenue, Vancouver, British Columbia V6J 1L4 (CA). **TSANG, Chi, Wing** [—/CA];
2081 West 44th Avenue, Vancouver, British Columbia V6M 2G1 (CA). **YAM, Mandy** [CA/CA]; #13, 10480 No. 3 Road, Richmond, British Columbia V7A 1W9 (CA).

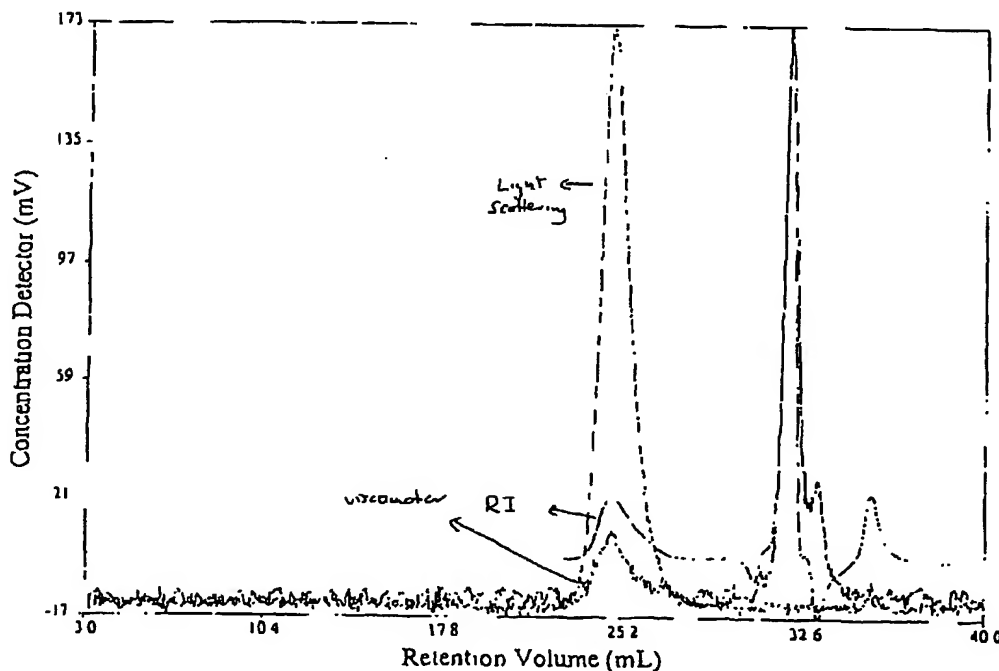
(74) Agents: **ROBINSON, J., Christopher** et al.; Smart & Biggar, Suite 2200, 650 West Georgia Street, Box 11560, Vancouver, British Columbia V6B 4N8 (CA).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,

[Continued on next page]

(54) Title: POLYMERIZATION OF PHOSPHAALKENES



(57) Abstract: Methods for polymerization of phosphalkenes using initiators are provided. Also provided are polymers and co-polymers in which the polymer backbone contains tracts of carbon and phosphorus atoms in approximately equimolar amounts. C-P bonds in the polymers of this invention may be predominantly in a head-to-tail arrangement or mixed arrangements. Co-polymers may comprise polyolefin monomer units.

BEST AVAILABLE COPY

WO 2004/055098 A3



ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE,
SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA,
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(88) Date of publication of the international search report:
2 September 2004

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No

PC/CA 03/01982

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C08G79/00 C08G79/04 C08G79/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C08G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, BEILSTEIN Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 1 299 992 A (ARMSTRONG CORK CO) 27 July 1962 (1962-07-27) page 1, column 1, line 1 - page 2, column 2, line 30	1-22
X	GB 1 021 016 A (TOKYO SHIBAURA ELECTRIC CO) 23 February 1966 (1966-02-23) page 1, column 1, line 9 - line 11 page 1, column 2, line 59 - page 2, column 1, line 31; claims 1-5; examples 1-11	1-22
X	FR 1 327 030 A (HOOKER CHEMICAL CORP) 17 May 1963 (1963-05-17) page 2, column 2, line 29 - line 42	1-22
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

8 June 2004

Date of mailing of the international search report

28/06/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Kiebooms, R

INTERNATIONAL SEARCH REPORT

International Application No

PC/CA 03/01982

C.(Continuation) DOCUMENTS CONSIDERED RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 898 759 A (AMERICAN CYANAMID CO) 14 June 1962 (1962-06-14) page 1, line 11 - line 34 claim 1; examples 10,11	1-22
X	GB 906 408 A (MICROCELL LTD) 19 September 1962 (1962-09-19) page 1, line 13 - line 27; claim 1; examples 1-5	1-22
X	S.KOBAYASHI, M.SUZUKI, T.SAEGUSA: "Kinetic studies on cationic ring-opening polymerization of 2-phenyl-1,2-oxaphospholane" MACROMOLECULES, vol. 17, 1984, pages 107-110, XP002283598 cited in the application the whole document	1-22
X	B.L.LUCHT, N.O.ST.ONGE: "Synthesis and characterizations of poly(p-phenylenephosphine)s" CHEMICAL COMMUNICATIONS, 2000, pages 2097-2098, XP002283599 cited in the application the whole document	1-22
X	A.KANAZAWA, T.IKEDA, T.ENDO: "Polymeric phosphonium salts as a novel class of cationic biocides. IV. Synthesis and antibacterial activity of polymers with phosphonium salts in the main chain" JOURNAL OF POLYMER SCIENCE, PART A, POLYMER CHEMISTRY, vol. 31, 1993, pages 3031-3038, XP002283600 cited in the application the whole document	1-22

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA 03/01982

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 1299992	A	27-07-1962	NONE	
GB 1021016	A	23-02-1966	DE 1545009 A1 FR 1365749 A	05-02-1970 03-07-1964
FR 1327030	A	17-05-1963	NL 271611 A	
GB 898759	A	14-06-1962	DE 1148234 B FR 1246650 A	09-05-1963 18-11-1960
GB 906408	A	19-09-1962	NONE	